Using the Evapotranspiration Viewer

General Information

The Evapotranspiration map allows users to find evapotranspiration (ET) datasets for Idaho, display them on a map and calculate ET and consumptive irrigation requirements (CIR) statistics for their area-of-interest. These statistics are derived using geoprocessing tools from Esri, as explained in the last paragraph of this section.

CIR is the amount of water required for consumptive use that is artificially applied to the soil. Seasonal CIR values do not account for the potential contribution of soil moisture accumulated during winter months. CIR is negative where precipitation exceeds evapotranspiration. Only seasonal CIR values are calculated. No monthly values are provided.

The ET datasets are developed using the METRIC (Mapping EvapoTranspiration at high Resolution with Internalized Calibration) satellite-based surface energy balance model developed by the University of Idaho. The ET datasets are derived from multi-band Landsat satellite data.

The ET Viewer has built-in tools to help you select your area-of-interest using any of the polygonal feature-layers present on the map, such as irrigation companies, water rights places-of-use, etc. See the section entitled Selecting Your Area of Interest from a Map Layer. You can draw a polygon on the map to define your own area-of-interest or load a compressed (ZIP-file) shape-file or KML from your device. See the section entitled Selecting Your Area of Interest from a Layer You Added for details. Your area-of-interest is used (much like a "cookie cutter") to define the portion of the ET dataset on which the statistics are calculated.

This ET Viewer uses Esri's ArcGIS Server GIS tools to help the user to locate their area-of-interest and compute the evapotranspiration (ET) and consumptive irrigation requirement (CIR) for that area. ET/CIR statistics are computed using Esri's ArcGIS Zonal Statistics as Table geo-processing tool.

App State

When you start the application on your device, if you have previously run the application a pop-up dialog will be displayed.

This *App State* pop-up, depending on your device, will appear either across the upper third of your screen or at the lower, right corner of the screen.

Tools Menu

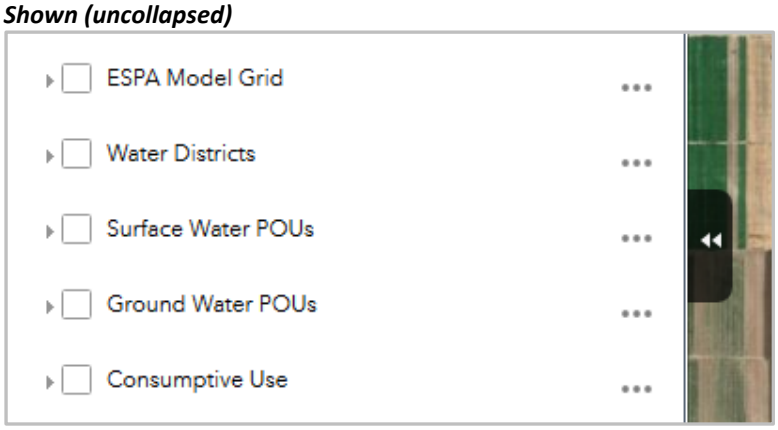
The menu, displayed on the left-hand side of the map, contains all of the tools you will need to select your area-of-interest and compute statistics. It also contains links to application documentation – including this document – and information concerning how to contact the IDWR.

Hide or Show the Tools Menu

The handle overlaying the left side, center of the map, can be used to hide or show the *Tools* menu. The menu is initially hidden on mobile devices.

Hidden (collapsed)

Shown (uncollapsed)



Customize Panel

The tools in this portion of the menu are used to change the way the map looks and provide a pathway to features which help to organize the way your area-of-interest can be determined.

Layer List Tool

This panel contains all of the layers in the map, some of which are provided to help the user locate their area-of-interest, except for background imagery. The *Layer List* tool allows you to turn individual layers on and off by placing a checkmark in the box beside the layer name. Layers having expansion arrows indicate that they contain sublayers or subtypes. The symbology for the layer can be shown by clicking those arrows.

Basemap Gallery

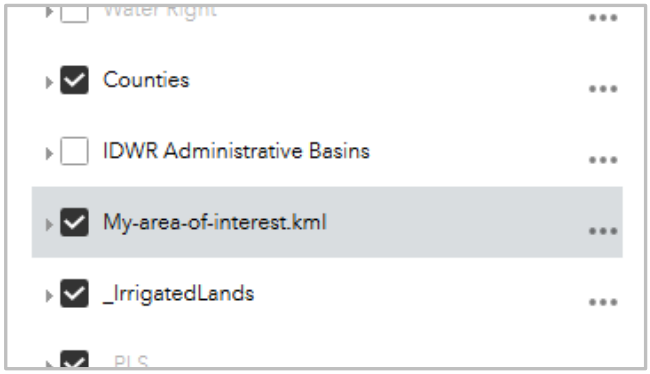
This panel contains all of the imagery available for use as a background. Backgrounds range from satellite imagery to thematic maps to ones which resemble historical topographic maps or maps those found in *National Geographic* publications. Note that the year in which the background imagery was obtained or drawn will not match the year of the ET dataset on which you are calculating statistics. So, field-condition, land-lines, etc. may not exactly fit the boundaries of your area-of-interest. You cannot supply your own background imagery.

Add Data

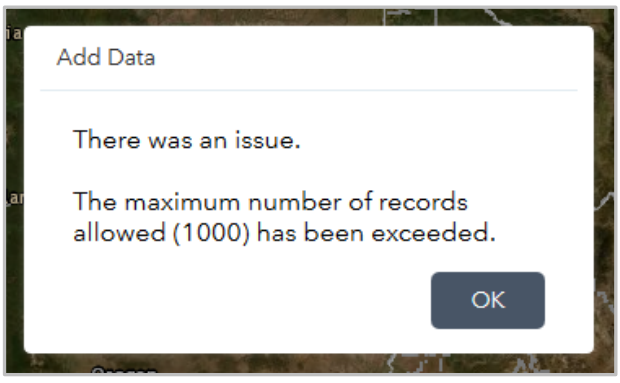
This tool allows you to add data from some "outside" source. The *Add Data* tool enables you to add layers from ***ArcGIS Online*** or ***Portal for ArcGIS*** content, entering URLs, or uploading local files. You can remove these layers by clicking the LAYERS button at the lower, right corner of the *Add data* tool's panel and then clicking the layer-name, for example "Three PODs from district 57".

Although you may add any kind of data to the map, the ETStatistics tool only operates on polygonal feature layers. You may add datasets that you, your agency or other agencies have shared via AGOL using the **Search** tab. You can add data using a web-site address (Esri map service, KML, CSV, etc.), using the **URL** tab. You may add files from your own device – shape-files, KML, etc. by using the **File** tab. All of the individual components of a shape-file (.SHP, .DBF, etc.) must contained in a ZIP-file. Note that multiple features from a zipped shape-file can be selected for processing and attributes can be viewed in the *Attribute table*. Features from CSV, KML, GeoJSON, etc. must be processed one at a time and attributes cannot be viewed in the *Attribute table*.

The layer you added will be shown in the Layer list.



The size of uploaded files is limited.



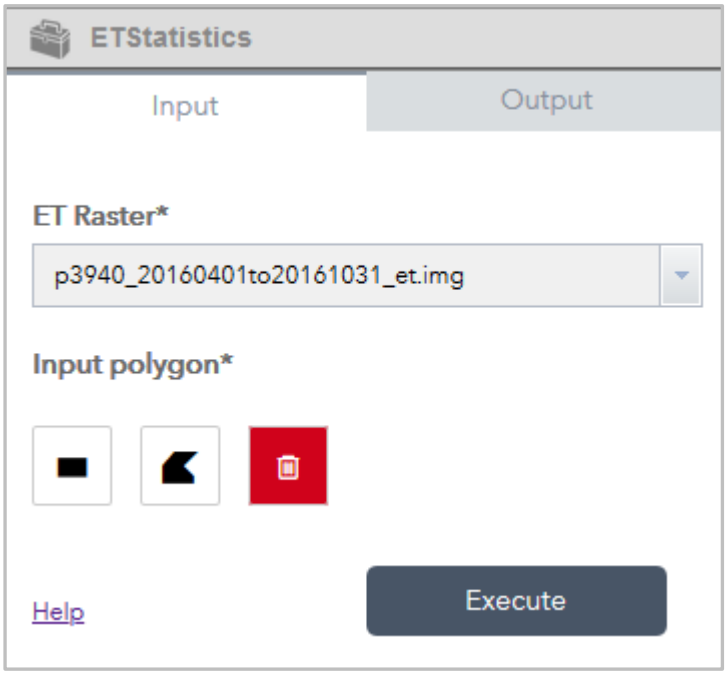
Select Features Panel

The *Select features* tool allows you to interactively select features from the map (any visible layer) and take actions on the selected features. The most useful action, for this tool in this application, is to select features and pass them to the *ETStatistics* tool, to use as the input polygon. Additionally, you can zoom to the selected feature(s), view their attributes in the attribute-table, save/export features, etc. Note that, in order to use the *Select features* tool on a specific layer, you must place a checkmark next to that layer in the *Layer list* tool. This tool explained in the "Select" section of Tools Used to Define Your Area of Interest.

ETCIRStatistics Panel

This *ETCIRStatistics* tool is the heart of the ***ET Viewer*** mapping application. When you open the panel, the following input-boxes and controls will be shown in order to define the input parameters for the *ETCIRStatistics* geoprocessing task.

Input Parameters



ET Raster – the ET dataset for which statistics will be calculated. If no dataset is currently visible on the map, the most recent seasonal dataset is selected. If you turn on an ET dataset, this value will be updated to reflect the visible dataset.

Input polygon – draw your area-of-interest using the *Extent* or *Polygon* tool). The *Extent* and *Polygon* tools allow you to draw a rectangle on the map.

Besides using the *Extent* and *Polygon* drawing tools (icons to the left of the "trash can") You can select those features in a number of ways, as explained in Tools Used to Define Your Area of Interest.

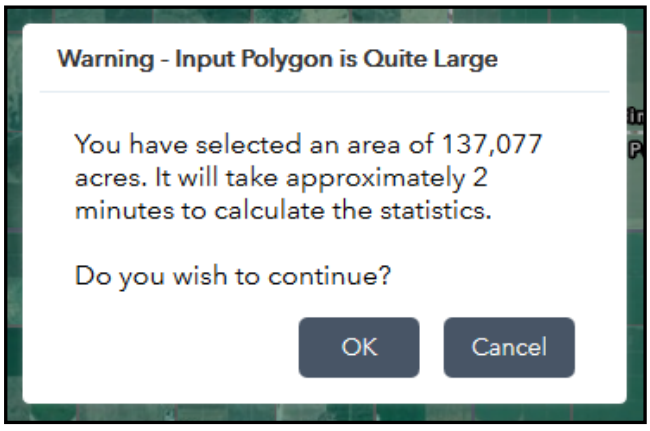
You cannot select from layers that are not visible on the map.

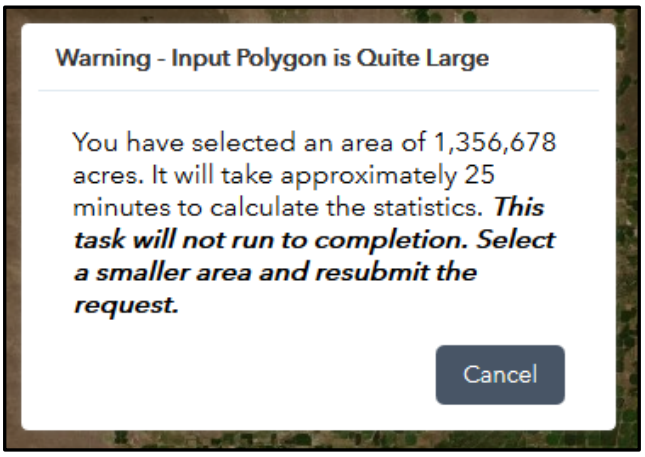
Note Concerning Size of Area-of-Interest

The size of the polygon(s) you draw or select will determine how long the task takes to complete. If you limit your requested input-polygon area to a few thousand acres the request should complete in under twenty seconds. A request for a large areas-of-interest – e.g. Aberdeen Springfield Canal Company (slightly more than 80,000 acres) – will typically take from eighty seconds to two minutes to complete, depending on server load.

Warnings Concerning Size of Area-of-Interest

If you request statistics for an area larger than 100,000 acres you will see a pop-up dialog with the warning on the left. This application will not allow a request for any area over one million acres (1563 square miles). In that case, you will see the dialog on the right.

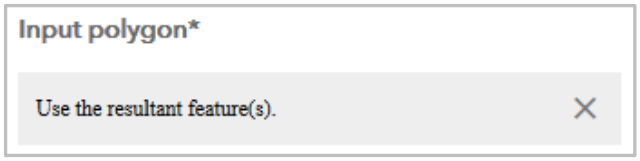




Tools Used to Define Your Area of Interest

Use any of the tools mentioned below to define your own area-of-interest.

Using the *Identify*, *Search* or *Select* tools:
If you select your area-of-interest using one of these tools, and click *Set as input of ETStatistics* from the context-menu, the *Input polygon* will look like this.



If, when using the *Set as input of ETStatistics* tool, the **Input polygon** does not say "Use the resultant feature(s)" see Fixing Errors Encountered while using Features Selected from a Layer.

Draw (Digitize)

If your area-of-interest is not defined in any of the map-layers, use the *Extent* or *Polygon* tools – available in the **Input polygon** parameter of the *ETStatistics* tool – to draw the area. Click a tool-icon to select it and then follow the instructions presented on the screen. You must double-click* the map in order to close the polygon.

If you need to draw more than one polygon, click the tool-icon and repeat the process. You can add polygons and rerun the task even if you have already executed the task on previously selected polygons. All of the polygons you draw will remain on the screen until you press the *Clear* icon (red trash-can) in the *ETStatistics* panel, even if you use other tools. Do not clear selected features until you are done using them; there is no way to re-select the features without repeating the entire process.

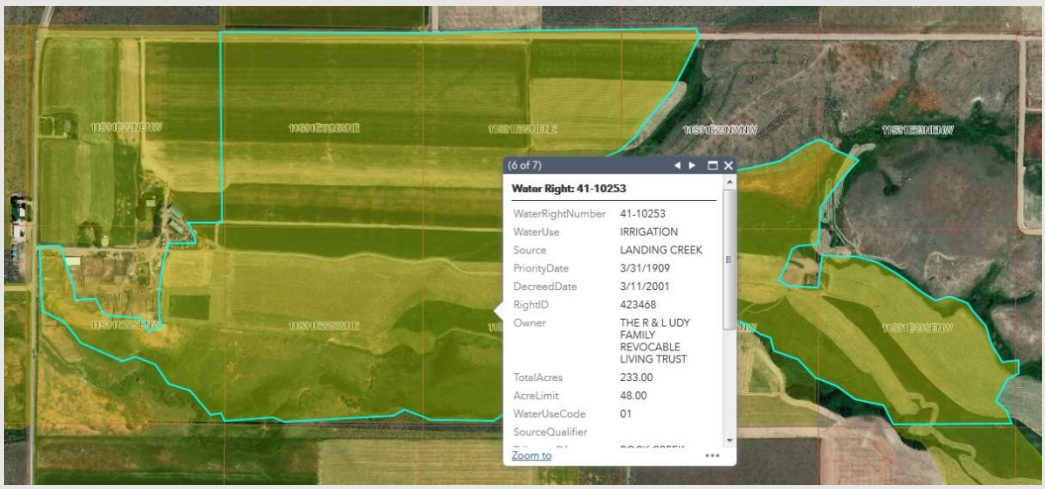
The method used to clear selected features varies depending on how those features were selected.

- **Identify tool** – click the "X" in the Input polygon field, to dismiss the *Use the resultant features(s)* text and then click the *Clear* icon (red trash-can).
- **Select tool** – open the *Select features* panel and click the **Clear** button.
- **Search tool** – click the "X" in the *Search* tool's text-box.

Identify

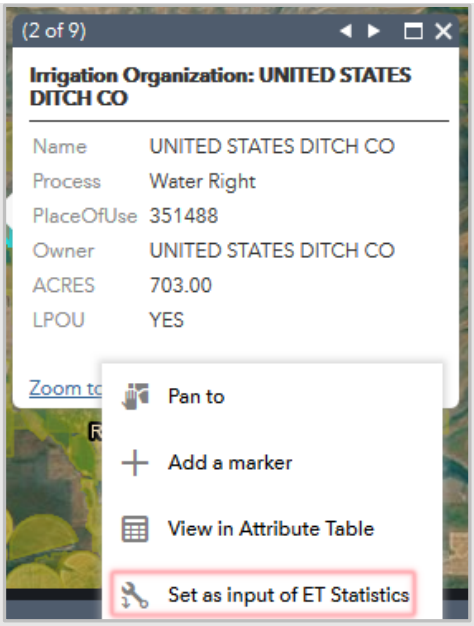
Turn on the layer containing the polygon which defines your area-of-interest. Click on that polygon – this uses the *Identify* tool. As shown in the image, the identified polygon will be highlighted and a pop-up dialog will display the attributes associated with that polygon. There may be several overlying features which include the point you clicked, so it may be necessary to use the arrows at the top of the dialog to "page through" the entities (in this case, a large water right) until you find the correct one.

In areas of the map where there are many overlapping features, it may be best to use this tool. In this example, there are four overlapping water rights as well as many PLSS features.



Click the right/left arrows at the top of the pop-up dialog to select a feature – the 6th features of 7 is selected.

Click the ellipse at the bottom of the dialog and click the **Set as input of ET Statistics** button.



When you see the correct feature, click the ellipses icon (the three "dots" at the bottom of the pop-up dialog). Click the **Set as input of ET Statistics** button.

The *ETStatistics* panel will be displayed showing **Input polygon** as "Use the resultant feature(s)". Click **Execute**.

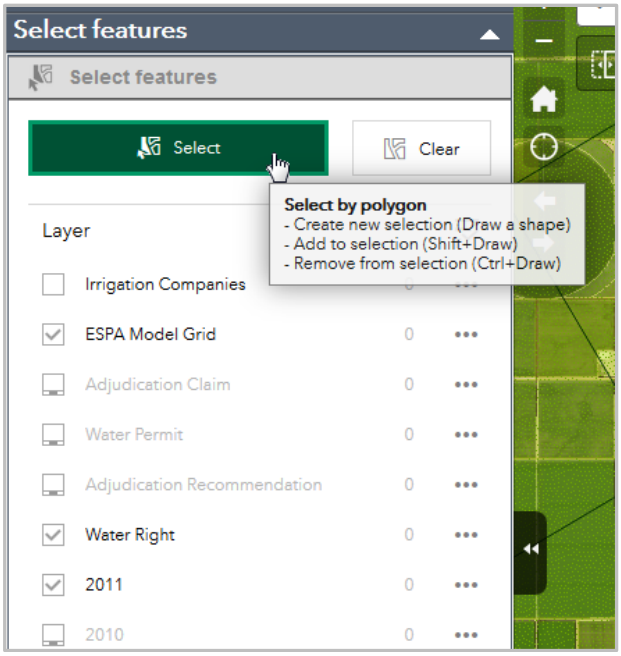
Search

As when using the *Identify* tool, turn on the layer containing a polygon which defines your area-of-interest. Click the *Search* tool's down-arrow icon and select the layer to search, e.g. **Water Right # or POUID**. Enter the search-string (water right # or POUID) and click the magnifying-glass icon. If results are presented below the *Search* tool, click on the appropriate item. Perform the same operations explained in the *Identify* tool.

Select

Using the *Select* tool works much the same as the *Identify* and *Search* tools with one exception. Since you are able to select multiple features from multiple layers, once the selection has been made, chose *Set as input to the ET Statistics*, in the *Select* tool's context-menu (click the ellipses "…" next to the layer from which you made your selection). To avoid confusion, place a check in the check-box of only the layer on which you wish to operate.

Note that you may only use the *Identify* or *Search* tools for layers you add to the map; you cannot use the *Select* tool.



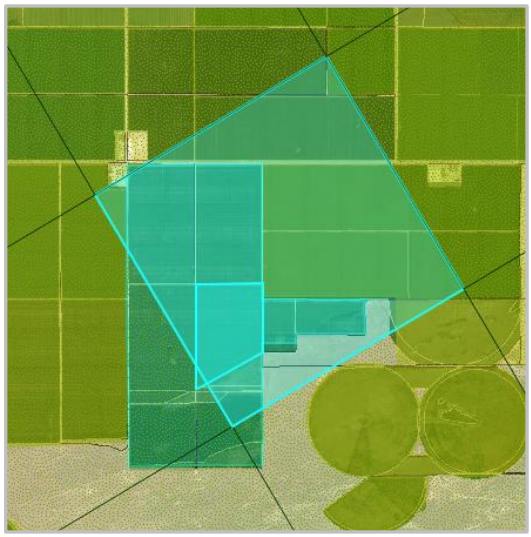
Open the *Select* tool's panel and click the **Select** button to highlight it (a bright border will surround the button). You will not be able to select features from any of the layers that are not currently visible on the map – those layer's checkboxes will be disabled and the layer titles will be shown in gray text.

The tooltip on the **Select** button tells you how select features by drawing on the map.

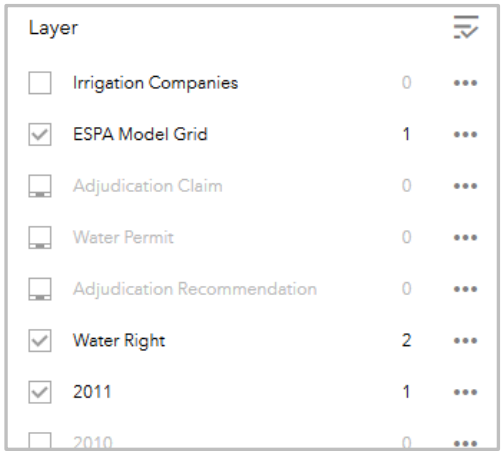
Check any layers you wish to make available for selection. In this example the tool will select (and highlight) ESPA Model Grid cells, water rights and polygons representing irrigated lands for 2011.

Draw a polygon on the map – it must be a polygon of at least three sides. You cannot complete the operation with a single point or line.

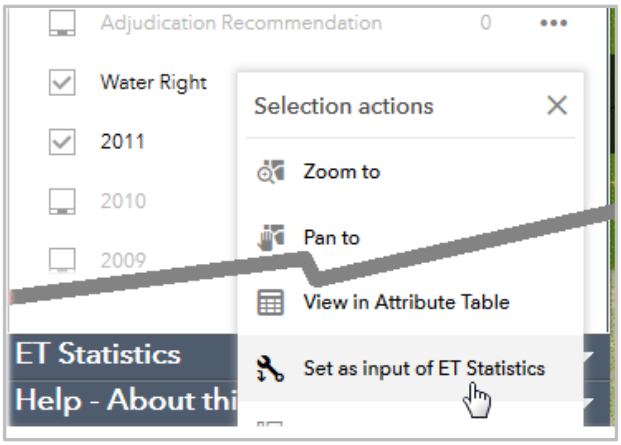
Polygons from several layers may be highlighted.



The list shown in the *Select* tool's panel tells you how many polygons were selected for each visible layer.



Click the ellipses for the layer that you want to use. In this example, the Water Right layer was selected. Because the *Select* tool has so many capabilities, in the figure to the right the list of **Selection actions** has been shortened. The full list includes options to export the features (or just the attributes), create a new map layer, etc.



Click the **Set as input of ET Statistics** button.

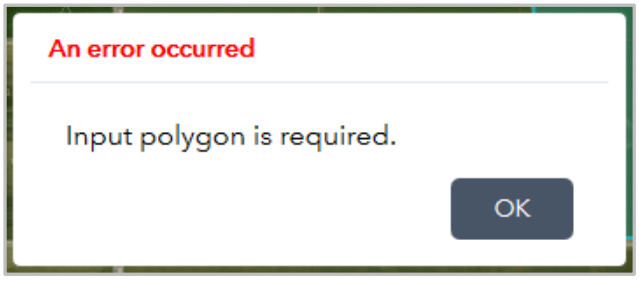
The *ETStatistics* panel will be displayed. Click the **Execute** button to run the task.

Fixing Errors Encountered while using Features Selected from a Layer

Note that, on occasion, the *ETStatistics* tool will not acknowledge that the *Select* or *Identify* tool was used to specify features for which to calculate statistics. In that case…

opening the **ETStatistics** panel will display:

If you click the Execute button, you will see this:



Click [once again] on the *Select* features panel and choose *Set as input of ETStatistics* from the context menu of the layer from which you selected polygons. The screen should now show this ➔

Selecting Your Area of Interest from the Attribute Table

You can select multiple features from the *Attribute table*. Multiple records may be selected by using Ctrl-click or Shift-click. You can modify the selection you made on the map.

FID	Farm	Reason
11	Triangle	No Water Right
12	Bigfoot Bar	No Water Right
13	Farm 3	BLM
14	Farm 3	BLM
15		IDFG

Selecting Your Area of Interest from a Map Layer

You can select your area-of-interest from any of the polygonal layers. Selecting a large area-of-interest (exceeding 100,000 acres) may cause the *ET Statistics* geoprocessing service to "time-out" before it returns results. We currently have ten irrigation companies which exceed this amount. In a "worst case scenario" the service may fail, causing an outage while it resets. This increases your wait-time for statistics.

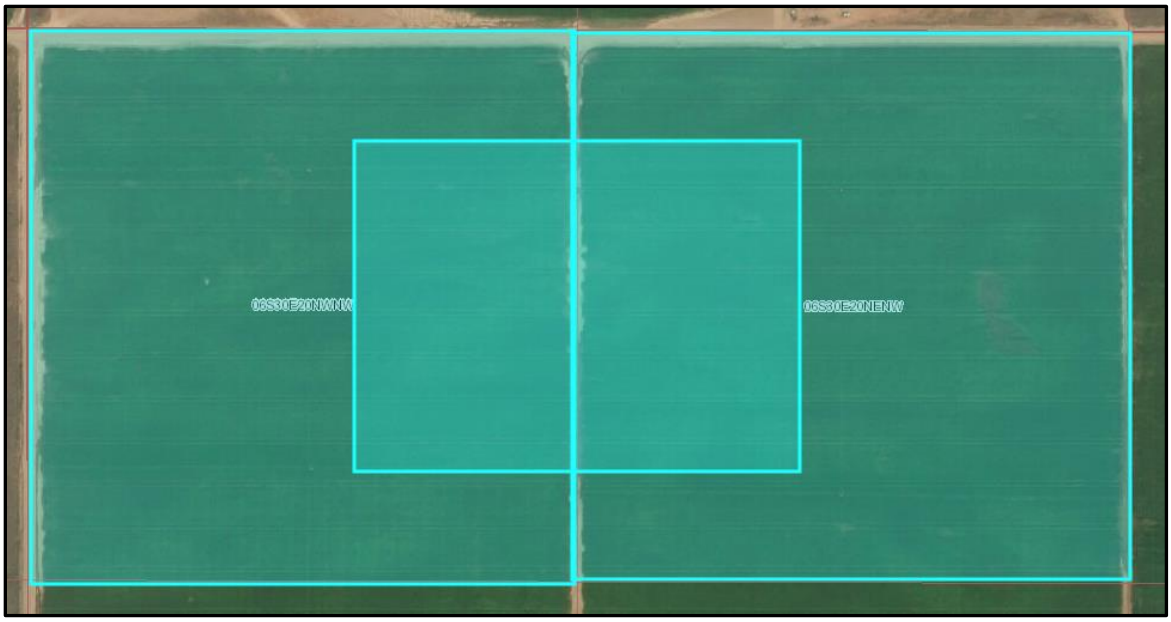
Running the task on individual or multiple features from the ESPA Model Grid, Irrigated Lands, Irrigation Companies or Water Right (including permits, claims and recommendations) layers will yield results. However, doing so on the ESPA model outline, county or administration basin will not!

Selecting Your Area of Interest from a Layer You Added

You cannot use the *Select* tool to select multiple polygons from added layers. Use the *Identify* tool to highlight a feature from the layer you added to the map. Follow the instructions for the *Identify* tool.

Double-Selecting an Area

Note that if you select multiple areas-of-interest so that they overlay, the polygons will be simplified and merged so that the geometry used to calculate the statistics will be properly formatted. For the example image, below, the total area selected covers two complete Public Land Survey System quarter-quarter-sections, which is approximately 80 acres. That area will be used for calculations.



Calculating ET and CIR Statistics

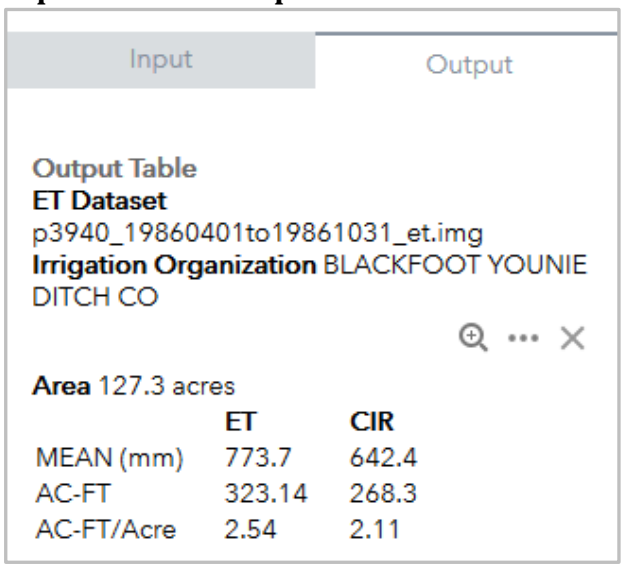
Executing the Task

Once you have identified your area of interest, click the **Execute** button. When the task associated with the *ETStatistics* tool completes, the output results will be displayed in the **Output** tab.

Output Results

The ET/CIR statistics are presented in the **Output** tab of the *ETStatistics* tool. The panel shows which ET dataset (if requested, the CIR dataset is for the same period of time) was used, the name of the input polygon and the statistics for the give area-of-interest.

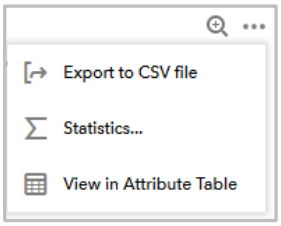
Explanation of Output tab



Enlarge View – displays a pop-up dialog, showing detailed statistics –max, standard deviation, etc.

Export – export the ET/CIR statistics

- *Export to CSV file* is the only way to download the statistics as a file.
- *Statistics…* (not useful in this context)
- *View in Attribute Table* does not allow for downloading as a file.



Enlarged View

Output Table

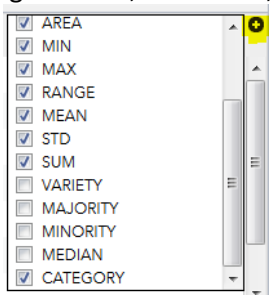
OBJECT	OBJECTID_	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM	VARIETY	MAJORI	MINORI	MEDIAN	CATI
1	1100547	162232	162232	479	938	459	725.836	129.423	117753	163	703	802	717	ET
2	1104075	162225	162225	317	971	654	716.383	140.881	116215	172	665	923	719	ET
3	1107787	162292	162292	189	936	747	558.966	134.887	907157	167	495	385	538	ET
4	1110204	162244	162244	317	553	236	476.432	41.5394	772982	97	498	385	488	ET
5	1100547	162232	162232	222	681	459	468.836	129.423	760603	163	446	545	460	CIR
6	1104075	162225	162225	40	714	674	446.813	144.745	724843	171	420	666	451	CIR
7	1107787	162292	162292	-88	659	747	289.639	130.672	470061	166	238	128	266	CIR
8	1110204	162244	162244	60	296	236	219.432	41.5394	356015	97	241	128	231	CIR

View in Attribute Table

The columns in this view can be resized, rearranged or hidden in order to make it more presentable. Note that the OBJECTID_1 column contains the OBJECTID of the feature layer used to define your area-of-interest.

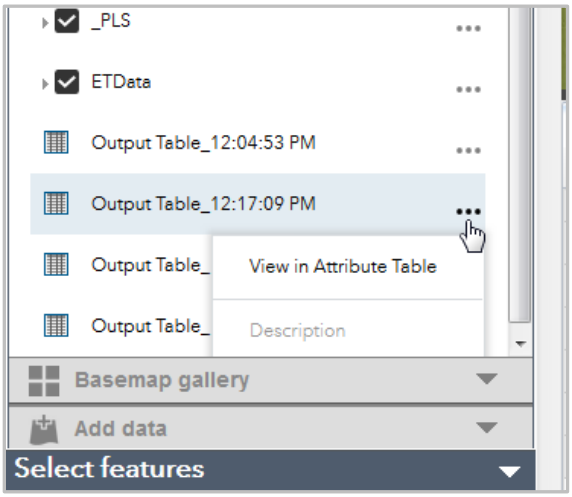
OBJECTID	OBJECTID_1	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM	CATEGORY
1	1100547	162232	162232	479	938	459	725.8367	129.4237	117753951	ET
2	1104075	162225	162225	317	971	654	716.3839	140.8816	116215384	ET
3	1107787	162292	162292	189	936	747	558.9660	134.8870	90715722	ET
4	1110204	162244	162244	317	553	236	476.4322	41.53942	77298268	ET
5	1100547	162232	162232	222	681	459	468.8367	129.4237	76060327	CIR
6	1104075	162225	162225	40	714	674	446.8139	144.7456	72484399	CIR
7	1107787	162292	162292	88	659	747	289.6396	130.6729	47006108	CIR

Hiding VARIETY, MAJORITY, etc.

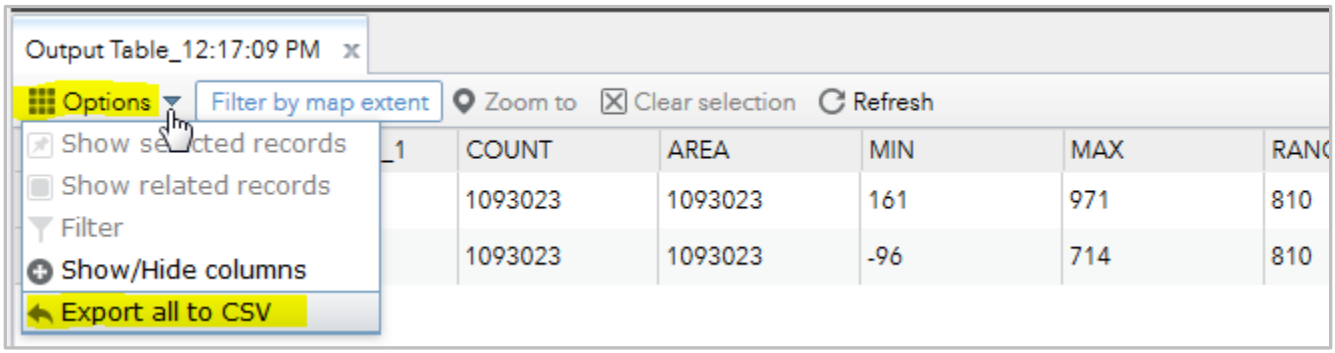


Reviewing Previously Calculated ET Statistics

You can view statistical output from earlier calculations (from the same browser session). Open the *Customize* panel then open the *Layer list* tool. Select an output table, click the ellipses and select **View in Attribute Table**.



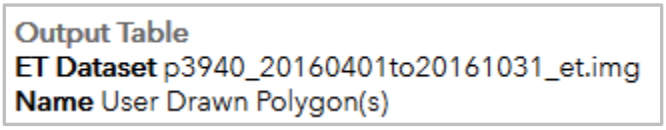
The statistics will be shown in the attributes table. As mentioned above, the columns can be resized, rearranged or hidden in order to make it more presentable. Note that the ***Export all to CSV*** – or ***Export Selected to CSV*** – option is meant for feature layers, not evapotranspiration calculations. The only way you can save <u>previously</u> generated evapotranspiration statistics is to select the rows in the *Attribute table*, using a mouse or touch-gesture, and use Ctrl-C (or equivalent) to copy the *Attribute table's* contents, then paste them in your document. Statistics from a current calculation can be downloaded, as mentioned on the previous page.



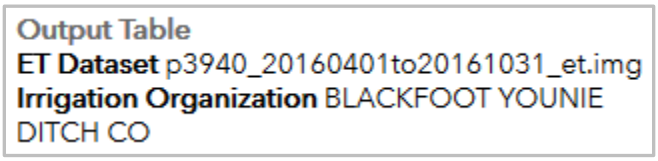
Feature-Names Displayed in Summary of ET Statistics Output

The application may or may not be able to determine the name of the features for which statistics were calculated.

The following is displayed when the user digitized one or more polygons on-screen. It will occasionally appear when the software cannot determine how the area-of-interest was chosen.



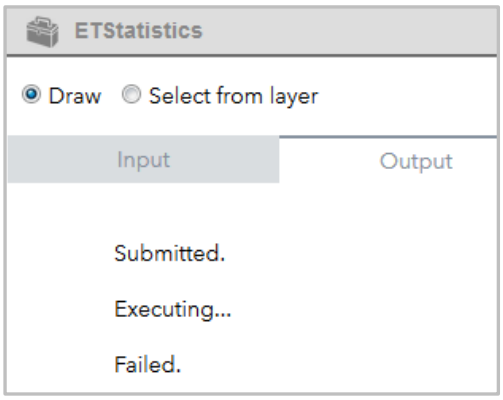
The irrigation companies were turned on and the Blackfoot Younie Ditch Co. was identified.



Errors Calculating Statistics

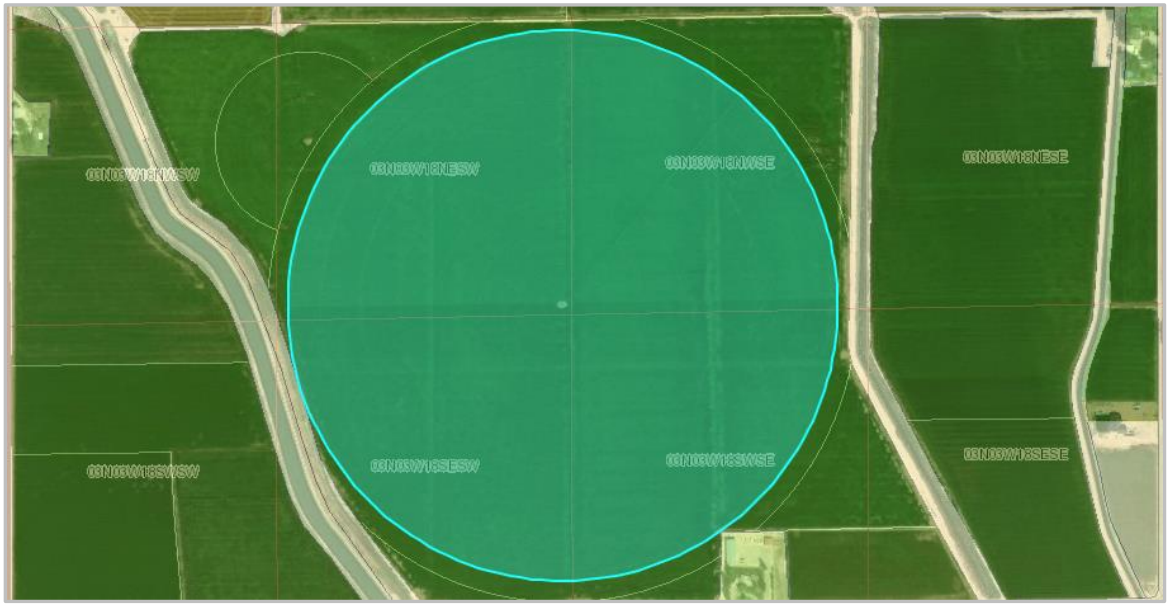
If you have not selected an ET dataset, the default 2016 seasonal dataset for Paths 39/40 will be used for calculation. That dataset covers the Eastern Snake Plain aquifer.

If you see the following display in the *ETStatistics* tool, your area-of-interest does not interest the currently selected ET dataset.

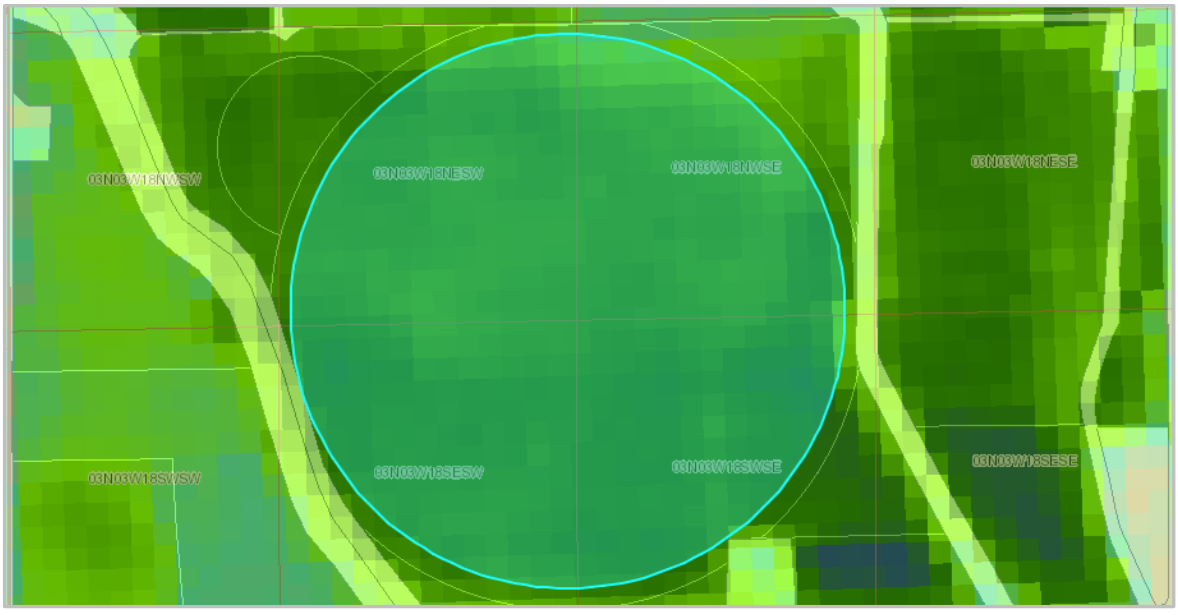


In the example, below, a polygon was selected from the Treasure Valley 2015 irrigated lands feature-layer. It is in western Idaho…and the default (eastern Idaho) ET dataset is used for calculations.

You can tell by the image that the irrigated lands and a background image are show but no ET dataset is shown.



Turn on the correct dataset (2015 seasonal dataset for Path 42) from and try your request again. Now the pixels representing the ET dataset are clearly visible.



Appendix – Tools Positioned on the Map

These tools are represented as icons which overlay the main map. In general, they are useful in manipulating the extent of the map.

Extent Tools Shown on the Map

Zoom in – make features on the ground appear larger

Zoom out – make features on the ground appear smaller

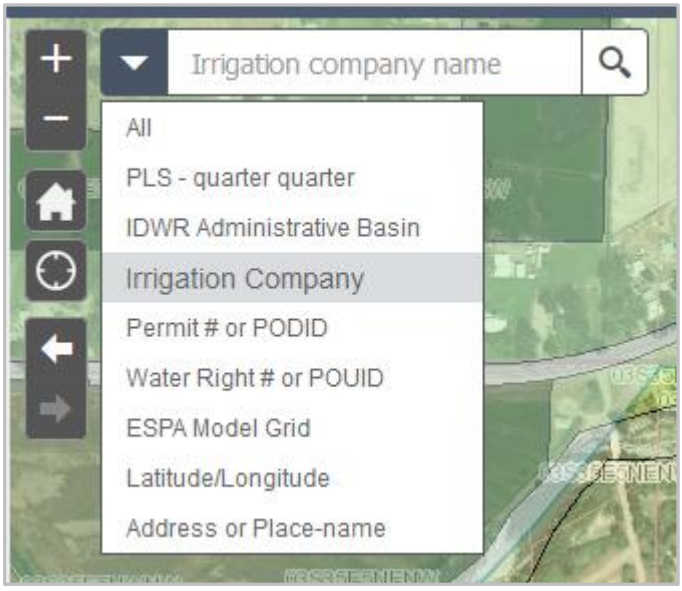
Default extent – Zoom out to view the entire State of Idaho

My location – turn on your device's GPS and click this icon to zoom to your current location and put a marker on the map at that location

Previous extent – return to the previous extent (the last view of the map before you zoomed or panned the map)
Next extent – return to the next extent (this is useful if you used the **Previous extent** button

Search Tool

The *Search* tool is used to find an area on the map based on any of the following:



Explanation
Click on a specific search-item to avoid searching all layers on the map.

A search for "PLS – quarter quarter" will bring up all QQs in a given township/range if you do not specify the section and QQ.

A street address, city name or place-name (name of a park, well-known landmark, etc.) can be used.

A CELL_INTGR code (e.g. 1082135) must be used when searching for an ESPA Model grid-cell.

Latitude/Longitude coordinates are entered like 116.1940W, 43.6089N.

Extent Tools Not Shown on the Map

The *Pan* tool is the only tool that is hidden from view.

Pan Tool

Unless you have activated a tool that uses the cursor to interact with the map (the *Select* tool or the onscreen drawing tool used in the *ETStatistics* tool) you can pan the map-extent by doing the following:

1. click on the map
2. hold down the mouse-button
3. drag the map to re-center it.*

** These instructions are written from the standpoint of a desktop or laptop computer user. Where any reference to a mouse are used, you can replace those words with the appropriate pointing device – for mobile-friendly devices the terms for gestures such as "swipe", "pinch", "tap" or "double-tap" would apply.*

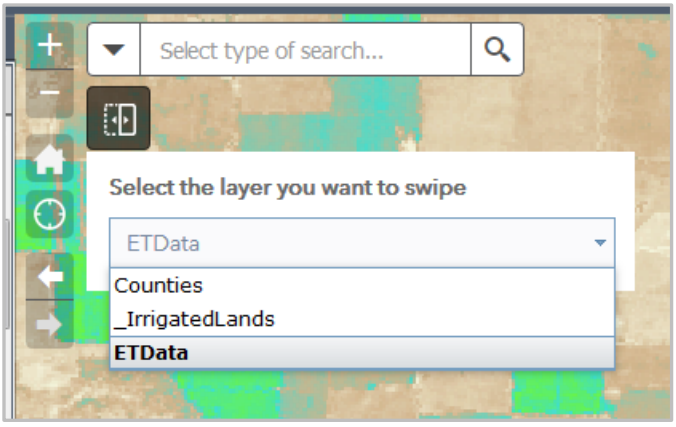
Application-specific Tools

Swipe Tool

The *Swipe* tool is used to expose a portion of the underlying layers (usually the background image) by partially removing an overlying layer.

Use the *Swipe* tool by clicking the icon, located beneath the *Search* tool.

You will be presented with a list of layers which you can "swipe" (e.g. an ET dataset, irrigated lands polygons, water rights, etc).



Using the Swipe Tool

When the Swipe tool is made active, you will see a bar which divides the map-screen in half, vertically. Click on the bar and move it left/right to expose more or less of the background layers. The following examples show the same geographical area.

Irrigated lands polygons over background imagery.

Irrigated lands polygons over ET dataset.

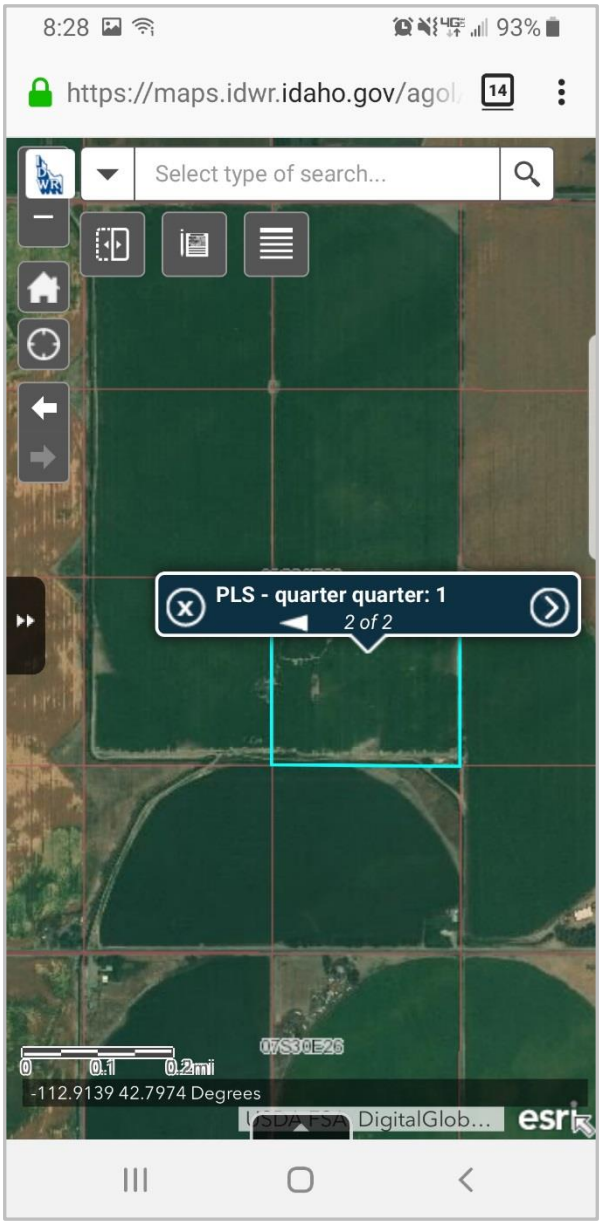
ET dataset over background imagery.

Appendix – Using Mobile Devices

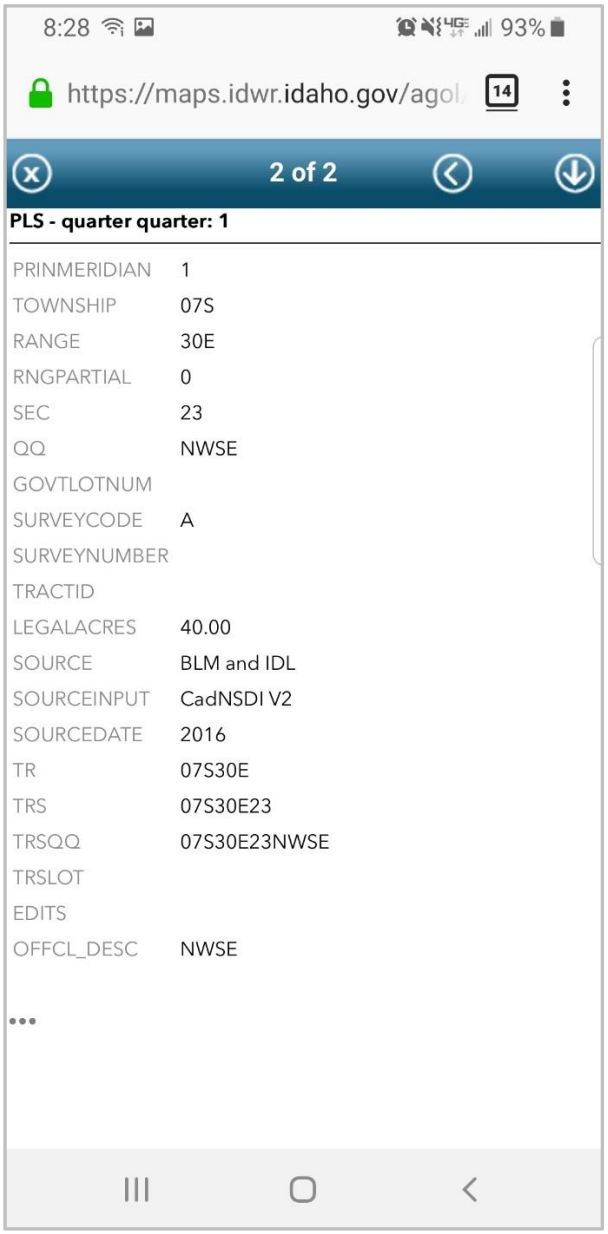
Identify

The operation of this tool is the same as for non-mobile computers except the pop-up dialog, which displays the attributes of the features, is drawn differently. As previously noted, there may be several overlying features which include the point you clicked; there may be many features within the same layer. If multiple results are shown, use the arrows at the top of the dialog to "page through" the entities to find the layer/feature that defines your area-of-interest (in this case, PLSS quarter-quarter section 07S30E23NWSE).

The boundary for the identified "PLS – quarter quarter" is highlighted. Click the arrow at the right side of the header to display the attributes.



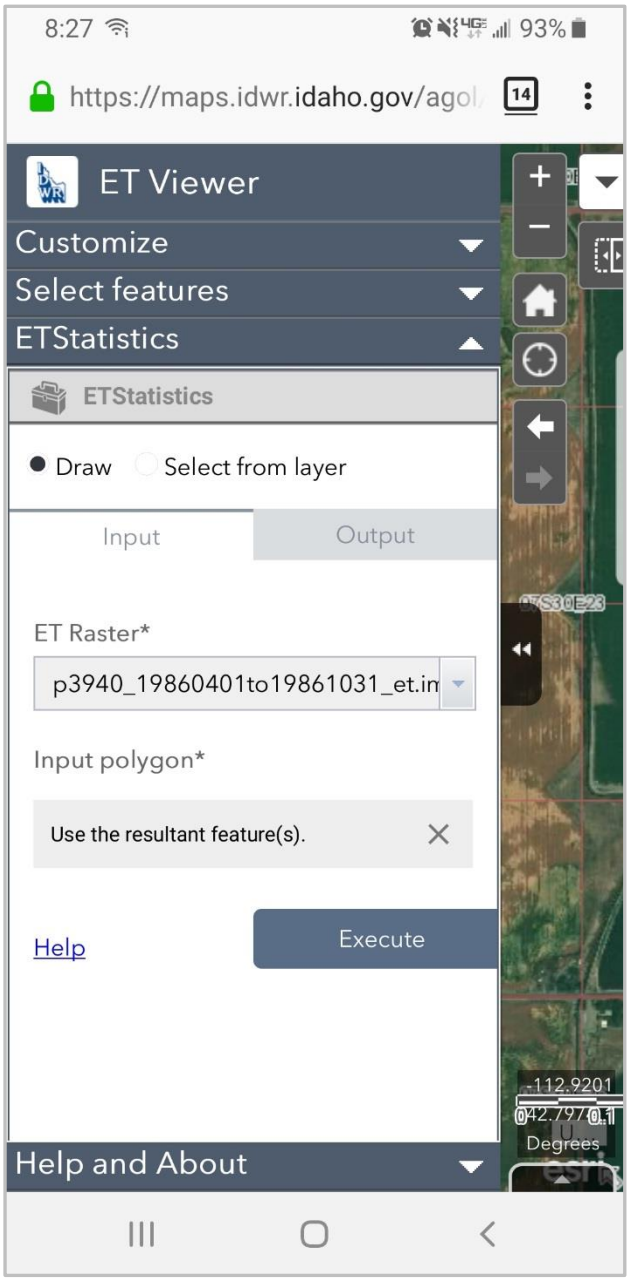
Click the ellipses, at the bottom of the dialog to bring up the context menu.



Running the Statistics

Click **Set as input of ETStatistics** button. Click the **minimize** icon (the "down arrow" at the right-end of the title-bar) to minimize the dialog.

The screen will look like the first screen-shot of this paragraph. Open the *ETStatistics* tool (if it is not open) and proceed as normal.



As mentioned here, the *ETStatistics* tool may not acknowledge that the *Select* or *Identify* tool was used to specify features for which to calculate statistics. In that case, return to the minimized dialog, maximize it and click the **Set as input of ETStatistics** button. Click the **minimize** icon and then the Input polygon's value [in the *ETStatistics* tool] should be "Use the resultant feature(s)" as shown in the screenshot, above, right.